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Docket No.: M4065.0082/P082-A
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Paul A. Farrar

Application No.: 09/638,026

Group Art Unit: 2811

Filed: August 14, 2000

Examiner: N. Parekh

For: METHOD OF FORMING A MICRO
SOLDER BALL FOR USE IN C4 BINDING
PROCESS

REQUEST FOR RECONSIDERATION

MS Non-Fee Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Dear Sir:

This application has been carefully reviewed in light of the Office Action dated April 17, 2003 (Paper No. 11). The application contains pending claims 40, 43-51, 68-72 and 74-75. Applicant notes that although the Office Action Summary (Form PTO-326) does not include claim 71 among the claims pending in the above-captioned patent application, the Office Action rejects claim 71, and it is indeed still pending.

Claims 40, 43-49, 68-69, 71-72 and 74-75 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,925,931 to Yamamoto (hereinafter "Yamamoto") in view of U.S. Patent No. 6,249,347 to Svetkoff et al. (hereinafter

"Svetkoff"). Applicant respectfully traverses this rejection.

The present invention is directed to a semiconductor device having on-die solder contacts that are at least two orders of magnitude smaller than prior art on-die solder contacts. (Specification at p. 5, lines 1 to 10). Independent claim 40 specifically recites a semiconductor device comprising: a semiconductor structure having at least one metal contact formed on a surface thereof; a first insulator layer overlying said at least one metal contact; at least one metal pad overlying said first insulator layer and in contact with said at least one metal contact; a second insulator layer overlying said at least first one metal pad; and at least one solder contact formed in the second insulator and in contact with said at least one metal pad, said solder contact having a diameter less than 100 μm . (Claim 40 (Twice Amended)).

The claimed on-die solder contacts provide electrical communication, alignment, and a physical connection between two semiconductor devices such as an integrated circuit (IC) and a module substrate. The use of these new, small on-die solder balls provides increased number and density of I/O terminals that can be placed on an IC chip providing increased data transmission rates (Specification at p. 4, lines 17 to 23).

The Office Action states that Yamamoto discloses a semiconductor device comprising a metal contact formed on the surface thereof; a first insulator layer overlying the metal contact; a metal pad overlying the first insulator layer and in contact with the metal contact; a second insulator layer overlying the metal pad; and a solder ball formed in the second insulator layer and in contact with the metal pad. The Office Action further states that Svetkoff teaches "a miniature/micro ball grid array (BGA) device using solder balls ... having a typical range of 10-300 microns to achieve the increased interconnect density and very fine geometries." The Office Action concludes that it would have been obvious to one of ordinary skill in the art at the time

the claimed invention was made to use the balls or bumps from Svetkoff in Yamamoto's device to obtain the claimed invention.

Applicant respectfully submits that Svetkoff is not analogous to the field of the present invention and therefore may not be used as the basis for an obviousness rejection under 35 U.S.C. § 103(a). Applicant further submits that, even if Svetkoff were analogous, it still does not sufficiently teach the solder balls claimed in the present invention and therefore, the semiconductor device claimed in the present invention is not rendered obvious by combining the teachings of Svetkoff and Yamamoto.

"In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." In re Oetiker, 977 F.2d 1443, 1446 (Fed. Cir. 1992); M.P.E.P. § 2141.01(a). A reference is "reasonably pertinent" if, "even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem." In re Clay, 966 F.2d 656, 659 (Fed. Cir. 1992).

Svetkoff discloses a method of imaging non-cooperative targets (including microelectronic and micromechanical targets) by illuminating a surface with a scanning beam and acquiring from at least one triangulation-based channel, and acquiring in parallel or sequentially at least one slice of confocal image data having substantially perfect temporal and spatial registration with the triangulation-based sensor data (col. 5, lines 11-20). This is different from the field of the present invention. Although the Office Action states that Svetkoff teaches a miniature ball grid array of solder balls "having a typical range of 10-300 microns to achieve the increased interconnect density and very fine geometries/ground rules," the solder balls mentioned in Svetkoff are not part of the invention therein and are simply given as an example of non-cooperative

targets that may be imaged by the claimed invention. There is nothing in the reference to teach or suggest how to make or use a die having solder balls in the range of 10-300 microns.

Unlike the present patent application, Svetkoff provides no insight into the field of designing improved semiconductor devices. Rather, Svetkoff relates to methods for imaging microelectronic and micromechanical devices. The two fields involve entirely distinct problems and solutions and therefore nothing commends Svetkoff's field to an inventor attempting to improve IC chip density and resulting data transmission rates, as required by M.P.E.P. § 2141.01(a). As a result, Svetkoff's mention of 10-300 micron solder balls cannot be permissibly combined with the teachings of Yamamoto to produce the invention claimed in the present patent application.

Even if Svetkoff were analogous prior art, Applicant respectfully submits that Svetkoff's disclosure with respect to solder balls is insufficient to produce the invention claimed in the present patent application when combined with the teachings of Yamamoto. As mentioned above, Svetkoff mentions solder balls or bumps 10-300 μm in diameter (col. 11, line 27-37). However, this is merely a bald reference to an example of a microelectronic or micromechanical device which can be imaged in Svetkoff, and not an enabling disclosure of a die structure having solder balls 10-300 μm in diameter.

As the Federal Circuit has stated: "In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." Beckman Instruments, Inc. v. LKB Produkter AB, 892 F.2d 1547, 1551, 13 USPQ2d 1301, 1304 (Fed. Cir. 1989) (citing In re Payne, 606 F.2d 303, 314, 203 USPQ 245, 255 (CCPA 1979) ("References relied upon to support a rejection under 35 USC 103 must provide an enabling disclosure, i.e., they must place the claimed invention in the possession of the public. An invention is not 'possessed' absent some known or obvious way to make it.") (citations omitted)). The Federal Circuit recently

reiterated this proposition in Motorola Inc. v. Interdigital Technology Corp., 121 F.3d 1461, 1472, 43 USPQ2d 1481, 1489 (Fed. Cir. 1997) (quoting Beckman, supra).

Where the reference does not include an enabling disclosure, "secondary evidence, such as other patents or publications, can be cited to show public possession of the method of making and/or using [the claimed article]." M.P.E.P. § 2121.01(I). Here, there is no enabling disclosure of solder balls in Svetkoff, and the Office Action fails to cite any secondary evidence that a method of making and/or using solder balls less than 100 μm in diameter was in the public possession at the time of the present invention. Only Applicant has disclosed how to form such small solder balls on a die.

In light of the foregoing reasons, claim 40 is allowable over the cited combination. Claims 43-51, 68-70, and 74-75 depend from claim 40 and are allowable along with claim 40. Claim 71 recites similar limitations to claim 40 and is therefore believed to be allowable for at least the reasons set forth above. Claim 72 depends from claim 71 and is allowable along with claim 71. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

Dated: July 16, 2003

Respectfully Submitted,

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